

JCM Verification Report Form

A. Summary of verification

A.1. General Information

Title of the project	Energy saving by optimum operation at an oil refinery
Reference number	ID014
Monitoring period	01/01/2018- 31/12/2018
Date of completion of the monitoring report	28/01/2019
Third-party entity (TPE)	Japan Quality Assurance Organization (JQA) (TPE-ID-003)
Project participant contracting the TPE	Yokogawa Electric Corporation
Date of completion of this report	14/02/2019

A.2 Conclusion of verification and level of assurance

Overall verification opinion	<input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative
<input checked="" type="checkbox"/> Unqualified opinion	<p>Based on the process and procedure conducted, JQA provides reasonable assurance that the emission reductions for Energy saving by optimum operation at an oil refinery</p> <ul style="list-style-type: none"> ✓ Are free of material errors and are a fair representation of the GHG data and information, and ✓ Are prepared in line with the related JCM rules, procedure, guidelines, forms and other relevant documents
<p><i>(If overall verification opinion is negative, please check below and state its reasons.)</i></p> <input type="checkbox"/> Qualified Opinion <input type="checkbox"/> Adverse opinion <input type="checkbox"/> Disclaimer	<State the reasons>

A.3. Overview of the verification results

Item	Verification requirements	No CAR or CL remaining
The project implementation with the eligibility criteria of the applied methodology	The TPE determines the conformity of the actual project and its operation with the eligibility criteria of the applied methodology.	<input checked="" type="checkbox"/>
The project implementation against the registered PDD or any approved revised PDD	The TPE assesses the status of the actual project and its operation with the registered/validated PDD or any approved revised PDD.	<input checked="" type="checkbox"/>
Calibration frequency and correction of measured values with related requirements	If monitoring Option C is selected, the TPE determines whether the measuring equipments have been properly calibrated in line with the monitoring plan and whether measured values are properly corrected, where necessary, to calculate emission reductions in line with the PDD and Monitoring Guidelines.	<input checked="" type="checkbox"/>
Data and calculation of GHG emission reductions	The TPE assesses the data and calculations of GHG emission reductions achieved by/resulting from the project by the application of the selected approved methodology.	<input checked="" type="checkbox"/>
Avoidance of double registration	The TPE determines whether the project is not registered under other international climate mitigation mechanisms.	<input checked="" type="checkbox"/>
Post registration changes	The TPE determines whether there are post registration changes from the registered PDD and/or methodology which prevent the use of the applied methodology.	<input checked="" type="checkbox"/>

Authorised signatory: Last name: Asada Title: Senior Executive Specimen signature: 	Mr. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/> First name: Sumio Date: 14/02/2019
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B. Verification team and other experts

	Name	Company	Function*	Scheme competence*	Technical competence*	On-site visit
Mr. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/>	Tadashi Yoshida	JQA	Team leader	<input checked="" type="checkbox"/>	Authorized	<input type="checkbox"/>
Mr. <input checked="" type="checkbox"/> Ms. <input type="checkbox"/>	Irhan Febijanto	External individual	Team member	<input checked="" type="checkbox"/>	Authorized	<input checked="" type="checkbox"/>
Mr. <input type="checkbox"/> Ms. <input checked="" type="checkbox"/>	Sachiko Hashizume	JQA	Internal reviewer	<input checked="" type="checkbox"/>	Authorized	<input type="checkbox"/>

Please specify the following for each item.

- * *Function: Indicate the role of the personnel in the validation activity such as team leader, team member, technical expert, or internal reviewer.*
- * *Scheme competence: Check the boxes if the personnel have sufficient knowledge on the JCM.*
- * *Technical competence: Indicate if the personnel have sufficient technical competence related to the project under validation.*

C. Means of verification, findings and conclusions based on reporting requirements

C.1. Compliance of the project implementation and operation with the eligibility criteria of the applied methodology

<Means of verification>

The project was registered as a JCM project on 10/07/2018, which applied JCM approved methodology ID_AM006_ver02.0 "GHG emission reductions through optimization of refinery plant operation in Indonesia" under the scheme of Joint Crediting Mechanism between Republic of Indonesia and Japan.

The purpose of the project is to reduce CO₂ emissions from an existing oil refinery processes by introducing Advanced Process Control systems (APC) developed by Yokogawa Electric Corporation. The target facility, which is located at Pertamina Refinery Unit V located in Balikpapan, East Kalimantan, consists of multiple hydrogen production units (HPU) and hydrocracking units (HCU), which are equipped with conventional control systems such as Distributed Control System (DCS). Compared to the single application of DCS, the combined use of APC and DCS can give higher energy efficiency by minimizing variability in key process, which leads to a greater energy saving.

In the registered project, APC was introduced to Train A, one of the two production lines, at Pertamina Refinery Unit V to optimize the operation of HPU and HCU. The function of the APC is categorized into Function A, B, C and D which contributes to the emission reductions of each process, *i.e.*, HPU and/or HCU, as defined by ID_AM006, but the

application of APC will be limited to Function A, C and D in the project. The monitoring will be conducted independently for Function A and Functions C & D, and then emission reductions calculated for each function will be aggregated as the total emission reductions for the project.

The reduction in heater fuel consumption of the HCU due to increased reactor temperature (Function A), the reduction in fuel consumption of HPU due to decreased hydrogen demand in HCU (Function C) and improved efficiency of hydrogen production in HPU (Function D) would contribute to the total emission reductions of the project. Thus, the annual emission reductions of 1,275 tCO₂ would be achieved by the project.

JQA has assessed whether the implementation and operation of the project during the monitoring period complies with the eligibility criteria of the applied methodology through the review of relevant documents, on-site inspection on 23/10/2018 and the interview with the PPs listed in Section F of this verification report.

The assessment results regarding the eligibility criteria are summarized as below:

Criterion 1

The project introduces APC to existing single or multiple hydrogen production units (HPU) and/or hydro cracking unit (HCU) at a refinery plant. APC serves one or more of the following functions:

	Location of installation	Location of emission reduction	Mechanism of emission reduction
A	HCU	HCU	Reduction in heater fuel consumption due to increased reactor column temperature
B	HCU	HCU	Reduction in reboiler fuel consumption in debutanizers due to reduced variability of column top pressure and lower the pressure
C	HCU	HPU	Reduction in fuel consumption in HPU due to reduced hydrogen demand in HCU
D	HPU	HPU	Improved efficiency of hydrogen production in HPU

Through the review of the relevant documents, on-site inspection and the interview with the PPs, the project information of Criterion 1 in the PDD is confirmed as follows:

- Due to the flooding in October 2017, the pre-determined linear regression equation obtained based on the historical data measured during the period of 01/04/2017 - 10/10/2017 was no longer applicable to the calculation of reference emissions for Functions C & D during the monitoring period, because the operation conditions of

equipment to calculate emission reductions saved by Functions C & D was significantly altered by the flooding. However, it was found that the original linear regression equation for Function A was still applicable to the calculation of reference emissions for the monitoring period and therefore the emission reductions of the project were conservatively claimed only for Function A except Functions C & D. Please note that APC system itself has worked well for Function C & D as well as Function A during the monitoring period.

As APC served Function A and Function C & D for the HCU and HPU process units during the monitoring period, it is concluded that the project meets Criterion 1 with a satisfactory result.

Criterion 2

The process unit where APC is introduced has been equipped with DCS in operation before the start of project.

Through the review of the relevant documents and the interview with the PPs, the project information of Criterion 2 in the PDD is confirmed as follows:

- The target process units (*i.e.*, HCU and HPU) of the project where APC is introduced have been equipped with DCS before the start of the project.

Hence, it is concluded that the project meets Criterion 2 with a satisfactory result during the monitoring period.

Criterion 3

Retrofit and replacement of the process units, cleaning of heat exchangers and/or columns which are performed during a turnaround beyond the regular maintenance activities are not taken place at the process unit where APC is introduced (this criterion is checked upon each instance of verification, and credit will be issued only up to the date of such retrofit). Regular maintenance includes daily inspections and lubrication of rotating equipment, as specified in instruction manual and/or maintenance manual which is defined by users.

Through the review of the historical records of turnaround and the interview with the PPs, the project information of Criterion 3 in the PDD is confirmed as follows:

- According to the “Turnaround (TA) schedule 2015-2021” at Pertamina RU V, the latest turnaround of HCU in Train A before the start date of the monitoring on 01/01/2018 was conducted in March 2017 and the next turnaround is planned to conduct in March

2021. This schedule shows that, after the turnaround in March 2017, no retrofit, replacement and cleaning of the target process units and reactors has been undertaken up to today. Therefore, the historical data taken during the period of 01/04/2017 – 10/10/2017 to obtain a linear regression equation for HCU and the monitoring data of $FI_{HCU,p}$ and $FC_{HCU,gas,p}$ during the monitoring period of 01/01/2018 – 31/12/2018 were measured under the same operation conditions after the turnaround in March 2017.

Hence, it is concluded that the project meets Criterion 3 with a satisfactory result during the monitoring period.

Criterion 4

Feed (or production volume), fossil fuel consumption, and hydrogen consumption at the process unit are acquired, integrated and recorded electrically according to pre-determined time intervals.

Through the review of the monitored data and the interview with the PPs, the project information of Criterion 4 in the PDD is confirmed as follows:

- The monitoring data of feed input to HCU reactor ($FI_{HCU,p}$) and natural gas (fuel gas) consumption in HCU heater ($FC_{HCU,gas,p}$) relevant to Function A have been continuously measured and hourly recorded during the monitoring period. These data are aggregated in the MRS to calculate emission reductions.

Hence, it is concluded that the project meets Criterion 4 with a satisfactory result during the monitoring period.

Regarding the exclusion of Function C & D and the implementation of turnaround, JQA raised CAR 01 and CL 03 and these issues were resolved as explained in “Findings”:

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

< CAR 01 >

The PDD states that the APC will serve Functions A, C and D in the project activity. The PPs are requested to explain the exclusion of Functions C & D during this monitoring period. Furthermore, please explain why Function A could be applied.

< Resolution by the PPs >

As stated in the registered PDD, the APC serves Function A, C and D in the project activity.

However, due to the natural disaster (*i.e.*, flooding) in October 2017, the operation conditions of equipment to quantify emission reductions saved by Functions C & D was significantly altered and hence the pre-determined linear regression equation to calculate reference emissions was no longer applicable to the data measured during the monitoring period starting after the flooding.

On the other hand, for Function A, it has been observed after the flooding that the original linear regression equation for the calculation of reference emissions was still applicable for the monitoring period. As such, the PP decided to give up claiming emission reductions for Functions C & D, but claim only for Function A.

Please note, it does not mean that APC has no energy conservation effect to Functions C & D. If the reference emissions for Functions C & D are revised using the data after the flood, the emission reduction related to Functions C & D will be positively counted.

<Assessment by TPE>

It is confirmed through the review of the relevant documents including historical data and the interview with the PPs that the original linear regression equation derived from the historical data measured for Functions C & D before flooding in October 2017 was no longer applicable to the calculation of reference emissions for the monitoring period, due to the significant change of operation conditions of the target process units. However, this conclusion does not mean that APC has no energy conservation effect to Functions C & D. If the linear regression equation for Functions C & D is newly prepared by using the data after the flooding, the emission reductions related to Functions C & D will be positively counted. Thus, CAR 01 is closed.

< CL 03 >

The PDD states in Criterion 3 that in case when TA is taken place, the relevant project-specific parameters shall be validated by the TPE and revised accordingly prior to JCM credit issuance. The PP is requested to provide the record of the last TA before the start of this monitoring period.

< Resolution by the PPs >

The “TA schedule 2015-2021” is provided by the PPs, which shows that the last TA of HCU in Train A was conducted in March 2017 before the start of the monitoring period and the next TA is planned to be March 2021.

<Assessment by TPE>

This schedule shows that there is no plan of TA between March 2017 and March 2021, and

the historical data during the period of 01/04/2017 – 10/10/2017 to obtain a linear regression equation for HCU and the monitoring data of $FI_{HCU,p}$ and $FC_{HCU,gas,p}$ for the monitoring period of 01/01/2018 – 31/12/2018 were taken within the same period after the TA in March 2017 under the same operation conditions. Hence, it can be concluded that the original linear regression equation is applicable to the calculation of reference emissions for Function A. Thus, CL 03 is closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the implementation and the operation of the registered project are in compliance with four eligibility criteria of the applied methodology ID_AM006 during this monitoring period.

C.2. Assessment of the project implementation against the registered PDD or any approved revised PDD

<Means of verification>

JQA has assessed the status of the actual project and its operation with the registered PDD through the review of the relevant documents, on-site inspection and interviews with the PPs. The project is implemented by the project participants of PT Pertamina (Persero) from Republic of Indonesia and Yokogawa Electric Corporation from Japan.

The assessment results are summarized as follows;

[Physical features of the project]

The Advanced Process Control Systems (APC) connected to the conventional Distributed Control System (DCS), developed by Yokogawa Electric Corporation, is applied to the operation of multiple hydrogen production units (HPU) and hydrocracking units (HCU) at Pertamina RU V to reduce CO₂ emissions mainly from heater fuel consumption for HPU and HCU. The commissioning of the project equipment was completed on 31/12/2017. The installation of these equipment complies with the description of the registered PDD.

JQA confirms through the on-site inspection for the first verification that the physical features of the project are in place and the PPs have implemented the project as per the registered PDD.

[Monitoring points]

Two monitoring parameters for Function A are measured by flow meters, in accordance

with the monitoring plan.

1. $FI_{HCU,p}$: Feed input to HCU reactor during the period p [m^3/p]
2. $FC_{HCU,gas,p}$: Consumption of natural gas (fuel gas) during the period p in HCU reactor Heater [ton/p] It is confirmed through the on-site inspection and interview with the PPs that the monitoring points for the measurement of feed input and natural gas (fuel gas) consumption are located at the right positions of HCU reactor and its heater. The feed input and natural gas (fuel gas) consumption are continuously monitored (every minute), hourly recorded and then aggregated for the monitoring period. Measured data is automatically transmitted to the server and double-checked by a responsible staff on a monthly basis to prevent the missing of data. Detailed information on the monitoring data of these parameters is described in Section C.4.

[Monitoring structure]

The monitoring structure has been established and the roles and responsibilities of the personnel are consistent with the description in Monitoring Structure Sheet. The staff training for operation, monitoring and maintenance of the system was conducted several times in February 2018.

It is confirmed through the review of relevant documents and the interview with the PPs that the monitoring activity has been appropriately implemented during the monitoring period, in line with the monitoring plan of the registered PDD.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the project has been implemented in accordance with the registered PDD during the monitoring period, and no changes are found from the description of the registered PDD.

C.3. Compliance of calibration frequency and correction of measured values with related requirements

<Means of verification>

The feed input to HCU reactor and natural gas (fuel gas) consumption by the heater of

HCU are measured by the flow meters which are manufactured by Fuji Electric Systems Co., Ltd., Azbil Corporation and Autrol Corporation of America.

The flow meters were calibrated by PT. Duta Katup Mas and Pertamina, using a test gauge, at the time of turnaround in March 2017, in accordance with the monitoring plan of the registered PDD.

It is confirmed through the review of calibration certificates and the interview with the PPs that flow meters were calibrated by a qualified entity at the time of the turnaround in March 2017. Therefore, no correction of measured values for feed input to HCU reactor ($FI_{HCU,R,p}$) and natural gas (fuel gas) consumption by HCU's heater ($FC_{HCU,gas,p}$) is required in the calculation of emission reductions.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the flow meters were calibrated at the time of turnaround in March 2017, in accordance with the monitoring plan of the registered PDD. Therefore, no correction of the measured values is required in the calculation of emission reductions.

C.4. Assessment of data and calculation of GHG emission reductions

<Means of verification>

JQA has assessed the data and calculation of GHG emission reductions achieved by the project activity as follows:

(a) The corresponding Monitoring Report Sheet of the applied methodology has been used;

Through the review of the monitoring report for the project which is titled as JCM_ID014_MP_yokogawa_result_jan to dec 2018.xlsx, it is confirmed that the Monitoring Report Sheets (MRS(input)_A, MRS(calc_process)_A) of applied methodology ID_AM006 are appropriately used.

(b) A complete set of data for the monitoring period for all parameters monitored ex post was provided to the verification team in the form of several kinds of files.

Monitoring Report Sheet (MRS) provided by the PPs contains a complete set of the

measured data on feed input to HCU reactor and natural gas (fuel gas) consumption by the heater of HCU for the monitoring period of 01/01/2018 - 31/12/2018.

It is confirmed through the review of the hourly recorded data that the data on feed input to HCU reactor and natural gas (fuel gas) consumption by the heater of HCU are fully provided for the monitoring period.

(c) Information provided in the monitoring report has been checked with sources such as plant logbooks, inventories, purchase records, laboratory analysis;

JQA has reviewed the correctness of measured data ($FI_{HCU,p}$ and $FC_{HCU,gas,p}$) given in the MRS through cross-checking with hourly data provided by the PPs. In case where the hourly data are deviated from the operation conditions under which the historical data were collected, such data are excluded from the valid hourly data group. As a result, the hourly data for 3,602 h within the monitoring period are selected as valid data which are shown in Table below. These data are used in the calculation of emission reductions.

Parameters	Measured values	Method to check values in the monitoring report with sources
$FI_{HCU,p}$ (m^3/p)	634,769.7	The value of feed input to HCU reactor in the MRS is cross-checked with hourly data downloaded from the server.
$FC_{HCU,gas,p}$ (ton/p)	6578.8	The value of natural gas (fuel gas) consumption by the heater of HCU in the MRS is cross-checked with hourly data downloaded from the server.

It is confirmed through the cross-check of the measured data in the MRS with the hourly data that feed input to the HCU reactor and natural gas (fuel gas) consumption by the heater of HCU are fully consistent with the sum of their valid hourly data downloaded from the server, and that reference emissions (RE_p), project emissions (PE_p) and emission reductions (ER_p) in the MRS are correctly calculated.

(d) Any assumptions used in emission calculations have been justified;

Through the review of the MRS and the interview with the PPs, it is confirmed that no assumption has been used in the calculation of emission reductions and hence no justification is required.

(e) Appropriate emission factors, default values, and other reference values have been correctly applied.

Through the review of the MRS and the relevant data and the interview with the PPs, it is confirmed that the values of the parameters a ($= -1.300028 \text{ GJ/m}^3$) and b ($= 328.01 \text{ GJ/h}$), which are determined by the linear regression analysis based on the historical data taken for the period of 01/04/2017 – 10/10/2017 after the turnaround in March 2017, are correctly applied in the calculation of reference emissions. Here, hourly based value of the parameter b is multiplied by the number of hours of valid data collection (*i.e.*, 3,602 h) to give 1,181,496.1 GJ ($= 328.01 \text{ GJ/h} \times 3,602 \text{ h}$). This value is applied to calculate reference emissions for this monitoring period (01/01/2018 – 31/12/2018).

In addition to the parameters a and b , it is confirmed that the net calorific value (NCV_{gas}) and CO_2 emission factor (EF_{gas}) of natural gas (fuel gas) are derived from the lower default value in Table 1.2 and Table 1.4 of 2006 IPCC, respectively, and these values are correctly applied in the calculation of project emissions.

The data monitored and required for verification and issuance is to be kept and archived electronically for two years after the final issuance of credits.

Regarding the description on calibration and monitoring frequency in Table 1 and the difference in emission reductions between *ex-ante* and *ex-post*, JQA raised CL 01 and CL 02 and these issues were resolved as explained in “Findings”.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

< CL 01 >

Regarding the description in "Measurement method and procedures" and "Monitoring frequency" of MRS,

- 1) The description of calibration is not consistent with that in the MPS. The PP is requested to clarify the inconsistency.*
- 2) The description of monitoring frequency is not consistent with that in the MPS. The PP is requested to clarify the inconsistency.*

< Resolution by the PPs >

The description in the MRS was revised according to those in the MPS.

<Assessment by TPE>

It is confirmed through the review of the revised MRS that the description on the calibration of measuring equipment and monitoring frequency in Table 1 is appropriately revised to be consistent with those in the MPS. Thus, CL 01 is closed.

< CL 02 >

The PP is requested to clarify the large difference in the emission reductions between ex-ante value (680 tCO₂) and ex-post value (2,734 tCO₂) for Function A.

< Resolution by the PPs >

Under the registered project, the energy saving effects of the APC for fresh/recycle reactors in the hydrocracking process are expected and counted for the emission reductions by the project. To avoid overestimation in emission reductions achieved by the project, taking into account the uncertainties associated with the effectiveness of APC at the time of validation, the project participant conservatively downsized the ex-ante emission reductions by excluding the quantity of emission reductions associated with the recycle reactor. In addition, the APC contributed to save the consumption of natural gas (fuel gas) in the HCU heaters as a result of the effective temperature raise of the feed than expected at the time of project registration. These effects have led to the emission reductions greater than the ex-ante estimation.

<Assessment by TPE>

The HCU hydrocracking process consists of fresh/recycle reactors and heaters. The reference emissions due to feed input to the fresh/recycle reactors and the project emissions from fuel consumption in the HCU heaters are taken into account to estimate emission reductions by the project activity. At the time of validation, the *ex-ante* reference emissions from the HCU reactors was estimated by excluding the emission from the recycle reactor to secure conservativeness, taking into account the uncertainties about the effectiveness of APC system in the operation control of refinery process units. On the other hand, the *ex-post* reference emissions are counted for both fresh and recycle reactors.

It is confirmed through the review of the relevant documents and the interview with the PPs that the increase in the *ex-post* emission reductions, compared to the *ex-ante* one, is caused 1) by the inclusion of reference emissions from the recycle reactor and 2) the decreased project emissions due to less consumption of natural gas (fuel gas) in the HCU heaters. Note that the project boundary is not changed between *ex-ante* and *ex-post* emission reductions calculation. Thus, CL 02 is closed.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the monitored data and default values are appropriately and correctly applied in the calculation of GHG emission reductions achieved by the project activity, in accordance with the applied methodology ID_AM006 and the monitoring plan of the registered PDD.

C.5. Assessment of avoidance of double registration

<Means of verification>

It is confirmed that a written confirmation from the PPs regarding no registration under other international climate mitigation mechanisms was provided at the time of validation and the declaration letter signed by the PP's representative in the MoC was submitted to the Joint Committee. In addition, it is re-confirmed through the check of the relevant website and the interview with PPs that the project has not been registered under any other mechanisms at the time of verification.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issues was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the project has not been registered under other international climate mitigation mechanisms.

C.6. Post registration changes

<Means of verification>

It is confirmed through the review of documents and the on-site assessment that the project has not been changed from the registered PDD and/or methodology.

<Findings>

Please state if CARs, CLs, or FARs are raised, and how they are resolved.

No issue was identified.

<Conclusion based on reporting requirements>

Please state conclusion based on reporting requirements.

JQA concludes that the project has not been changed from the registered PDD and/or methodology.

D. Assessment of response to remaining issues

An assessment of response to the remaining issues including FARs from the validation and/or previous verification period, if appropriate

No issues including FAR from the validation are remained. As this is the first verification, no issues from the previous verification are also remained.

E. Verified amount of emission reductions achieved

Year	Verified Emissions (tCO ₂ e)	Reference Emissions (tCO ₂ e)	Verified Project Emissions (tCO ₂ e)	Verified Emission Reductions (tCO ₂ e)
2013				
2014				
2015				
2016				
2017				
2018		19,345.9	16,611.0	2,734
2019				
2020				
Total (tCO ₂ e)				2,734

Note: The verified emission reductions in each year are rounded down after the decimal point.

F. List of interviewees and documents received

F.1. List of interviewees

- Wataru Ando, Project Manager, Yokogawa Electric Corporation
- Djatmiko Darmo Saputro, Lead of Process Engineering, PT. Pertamina RU V (Balikpapan)
- Taufik Basuki H, Group leader of Process control, PT. Pertamina RU V (Balikpapan)
- Happy Ramadhan, Process Engineer, PT. Pertamina RU V (Balikpapan)
- Yudhistiro Doddy Sadewo, Process Engineer, PT. Pertamina RU V (Balikpapan)
- Suwega D, Instrument Engineer, PT. Pertamina RU V (Balikpapan)
- Chisato Nakade, Senior Consultant, Environmental Strategy Advisory Div., Mitsubishi UFJ Morgan Stanley Securities Co.,Ltd.
- Ricky Tagar Risnauli, Senior Consultant, Environmental Strategy Advisory Div., Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.

F.2. List of documents received

1. PDD, ver. 02.0 (ID014), 21/02/2018
2. Monitoring Spreadsheet: JCM_ID_AM006_ver02.0 (ID014), 21/02/2018
3. JCM Validation Report (ID014), 14/03/2018
4. JCM Modalities of Communication Statement Form (MoC), 07/07/2017
5. JCM Approved Methodology ID_AM006_ver02.0, 04/12/2017, JC7, Annex 2
6. JCM Glossary of Terms (JCM_ID_Glossary_ver02.0)
7. JCM Project Cycle Procedure (JCM_ID_PCP_ver05.0)
8. JCM Guidelines for Developing Project Design Document and Monitoring Report (JCM_ID_GL_PDD_MR_ver03.0)
9. JCM Guidelines for Validation and Verification (JCM_ID_GL_VV_ver01.0)
10. JCM Verification Report Form (JCM_ID_F_Vrf_Rep_ver01.1)
11. Hourly data record of monitoring parameters (No.1 & No.3) relevant to Function A during the monitoring period.
12. Clarification for the missing of monitoring parameters (No.12, No.16, No. 17) relevant to Functions C & D during the monitoring period (Criterion 1).
13. Overall system configuration including DCS, prepared by PT. Yokogawa Indonesia, 31/01/2017 (Criterion 2).
- 14-1. Turnaround (TA) schedule of Pertamina RU-V for the period of 2015-2021 (Criterion 3).
- 14-2. Records of TA for the period of 2007 - 2017
15. Historical data taken during the period of 01/04/2017 – 10/10/2017.
16. APC manual for operators for RU-V Balikpapan prepared by Yokogawa Electric Corporation, 30/11/2017,
- 17-1. Location of monitoring points No.1 and No. 3 relevant to Function A.
- 17-2. Process flow diagram of HCU-A reactor section
- 17-3. Process flow diagram of HCU-A feed-in section
- 18-1. Specification of the differential pressure transmitter (FKC-4) for feed input flow, manufactured by Fuji Electric Systems Co., Ltd.
- 18-2. Specification of the differential pressure transmitter (GTX00D) for feed input flow, manufactured by Azbil Corporation.
- 18-3. Specification of flow meter (APT3100) for natural gas, manufactured by Autrol Corporation.
19. Monitoring structure for the registered project including information and data flow
20. Calibration certificate of test gauge, issued by PT. Indotech Citra Sinergi on 03/03/2017.
- 21-1. Memorandum regarding periodical calibration plan of flow meters issued by PT. Pertamina (Persero), 28/09/2018

- 21-2. List of calibration target flow meters for the project
- 22-1. Calibration certificate of feed input flow meter (FT-098/105), issued by PT. Duta Katup Mas, 27/03/2017.
- 22-2. Calibration certificate of natural gas flow meter (FT-202/216), issued by Perbaikan & Kalibrasi Peralatan Instrument, 20/07/2017.
- 23-1. Training text: APC and PACE introduction
- 23-2. Training text: Structure of PACE
- 23-3. Training text: Model Identification
- 23-4. Training text: Quality Estimator Modelling
- 23-5. Training text: Variable Pre-processing
- 23-6. Training text: Model Building Control and Estimation Layers
- 23-7. Training text: Variable Sets
- 23-8. Attendee's list for APC training
- 24. Outline of APC and estimation of emission reductions for each function

Annex Certificates or curricula vitae of TPE's verification team members, technical experts and internal technical reviewers

Please attach certificates or curricula vitae of TPE's validation team members, technical experts and internal technical reviewers.

Statement of competence



Statement of competence



Name: Dr. Tadashi Yoshida

Qualified and authorized by Japan Quality Assurance Organization.

Name: Dr. Irhan Febijanto

Qualified and authorized by Japan Quality Assurance Organization.

Function		Function	
	Date of qualification		Date of qualification
Validator	2014/12/22	Validator (JCM project only)	2017/8/21
Verifier	2014/12/22	Verifier (JCM project only)	2017/8/21
Team leader	2014/12/22	Team leader	-

Technical area within sectoral scopes		Technical area within sectoral scopes	
	Date of qualification		Date of qualification
TA 1.1. Thermal energy generation	2014/12/22	TA 1.1. Thermal energy generation	2014/12/22
TA 1.2. Renewables	2014/12/22	TA 1.2. Renewables	-
TA 3.1. Energy demand	2014/12/22	TA 3.1. Energy demand	2014/12/22
TA 4.1. Cement and lime production	2015/11/12	TA 4.1. Cement and lime production	-
TA 4.6. Other manufacturing industries	2014/12/22	TA 4.6. Other manufacturing industries	-
TA 5.1. Chemical industry	2014/12/22	TA 5.1. Chemical industry	-
TA 10.1. Fugitive emissions from oil and gas	2014/12/22	TA 10.1. Fugitive emissions from oil and gas	-
TA 13.1. Solid waste and wastewater	2014/12/22	TA 13.1. Solid waste and wastewater	-
TA 14.1. Afforestation and reforestation	-	TA 14.1. Afforestation and reforestation	-

Statement of competence



Name: Ms. Sachiko Hashizume

Qualified and authorized by Japan Quality Assurance Organization.

Function	
	Date of qualification
Validator	2015/11/20
Verifier	2015/11/20
Team leader	2018/6/22

Technical area within sectoral scopes	
	Date of qualification
TA 1.1. Thermal energy generation	2015/11/20
TA 1.2. Renewables	2015/11/20
TA 3.1. Energy demand	2015/11/20
TA 4.1. Cement and lime production	-
TA 4.6. Other manufacturing industries	-
TA 5.1. Chemical industry	-
TA 10.1. Fugitive emissions from oil and gas	-
TA 13.1. Solid waste and wastewater	2015/11/20
TA 14.1. Afforestation and reforestation	-